THE FOLLOWING IS THE ENGLISH TRANSLATION OF THE ANNEXES TO THE INTERNATIONAL PRELIMINARY EXAMINATION REPORT : AMENDED SHEETS (Pages 1, 1a, 7, 8 and 9).

Device and process for measuring luminous intensity by means of a photomultiplier equipped with a calibration source

The invention relates to the measurement of luminous intensity by means of photomultipliers.

The gain of a photomultiplier is subject to short-term fluctuations, such as those resulting from variations of the temperature of this photomultiplier, and to long-term fluctuations or drifts, such as those resulting from wear and aging of this photomultiplier.

These fluctuations or drifts of the gain introduce errors into the measurements delivered directly by the photomultiplier.

The purpose of the invention is to avoid this disadvantage.

To this end, one object of the invention is a device for measuring the luminous intensity of radiation, comprising a photomultiplier equipped with a main window for entrance of the said radiation and an entrance photocathode disposed in the field of the said window, characterized in that it also comprises a calibration source designed to emit radiation of constant intensity oriented toward the said photocathode.

The invention can also exhibit one or more of the following characteristics:

- the said calibration source is an electroluminescent diode,
- the wavelength of the maximum emission intensity of the said diode falls within the wavelength region of maximum sensitivity of the said photomultiplier,
- the device comprises a scintillator element disposed across the main entrance window and designed to convert the radiation to be measured to radiation of wavelength matched to the sensitivity of the said photomultiplier, the calibration source emitting directly toward the said photocathode without passing through the scintillator.

Since the scintillator element is generally not subject to any fluctuation or drift, the calibration radiation can be applied directly to the photomultiplier without passing through the scintillator.

Another object of the invention is a device for measuring the interaction of radiation with a material, comprising a primary source of radiation, a device according to the invention for measuring the luminous intensity of the radiation that has interacted with the said material, and means for disposing the said material in the path of the

CLAIMS

1. - A device (2) for measuring the luminous intensity of radiation, comprising a photomultiplier (4) equipped with a main window for entrance of the said radiation and an entrance photocathode disposed in the field of the said window, characterized in that it also comprises a calibration source (5) designed to emit radiation of constant intensity oriented toward the said photocathode.

2. - A device according to claim 1, characterized in that the said calibration source is an electroluminescent diode.

3. - A device according to claim 2, characterized in that the wavelength of the maximum emission intensity of the said diode falls within the wavelength region of maximum sensitivity of the said photomultiplier.

4. - A device according to any one of the preceding claims, characterized in that it comprises a scintillator element (8) disposed across the main entrance window and designed to convert the radiation to be measured to radiation of wavelength matched to the sensitivity of the said photomultiplier, the calibration source emitting directly toward the said photocathode without passing through the scintillator element (8).

5. - A device for measuring the interaction of radiation with a material (3), comprising a primary source (1) of radiation, a device (2) according to any one of claims 1 to 4 for measuring the luminous intensity of the radiation that has interacted with the said material (3), and means for disposing the said material (3) in the path of the radiation between the said primary source (1) and the said measuring device (2).

6. - A device according to claim 5, characterized in that the said primary source of radiation is an X-ray source.

7. - A device according to any one of the preceding claims, characterized in that it comprises:

- means for turning off the radiation source (1) or for blocking the radiation to be measured,
- means for activating the said calibration source (5) exclusively during the periods when the said radiation is turned off or blocked,
- and means for calculating the ratio of the measurement performed by the photomultiplier (4) subjected to the radiation to be measured during a period when this radiation is not turned off or blocked to the measurement performed by the photomultiplier (4) under the same conditions during a period when the calibration source (5) is activated.

8. - A device according to claim 7, dependent on claim 6, characterized in that the said X-ray source is pulsed to ensure that the said source (1) is periodically turned off.

9. - A device according to claim 8, characterized in that the said pulsed source comprises an X-ray emission tube provided with a filament, an anode and a cathode, plus means for applying a high alternating voltage between the said anode and the said cathode.

10. A process for measuring the luminous intensity of radiation by means of the device according to any one of claims 1 to 4, wherein the ratio of the measurement of the radiation to be measured to that of the radiation of the calibration source (5) is calculated.

11. A process for measuring the luminous intensity of radiation by means of the device (2) according to any one of claims 1 to 4, characterized in that it comprises the successive stages in which:

- while the calibration source (5) is turned off or blocked, the intensity of the radiation to be measured is measured by means of the photomultiplier (4),

- thereafter, while the radiation to be measured is turned off or blocked, the intensity of the radiation of the calibration source (5) is measured by means of the photomultiplier (4) maintained under the same adjustment conditions,
- and the final value of the intensity of the radiation is deduced by calculating the ratio of the measurement of the radiation to be measured to that of the radiation of the calibration source.

12. The use of the device according to any one of claims 1 to 9 or of the process according to any one of claims 10 to 11 for measuring the thickness of a material (3) interacting by absorption with the said radiation to be measured.